Math 609
Problem set 1 due January 24, 2008
Dr. Epstein

Reading: Chapter 1 of Stein-Shakarchi. The problems are taken from pages 24–31 of the text.

Standard problems: The following problems should be done, but do not have to be handed in: 1, 3, 6, 14 (it is very important that you know this formula), 19, 20, 23, 24, 26. These problems cover background material that you are expected to know.

Homework assignment: The solutions to the following problems should be carefully written up and handed in.

1. Problem 4 on page 25.

2. Problem 7 on page 26-7.

3. Problems 8, 10, and 11 on page 27.

4. Suppose that f is a holomorphic function in an open subset $\Omega \subset \mathbb{C}$, and that $z(t) : [0, 1] \to \Omega$ is a differentiable curve. Prove that the chain rule chain be expressed in terms of complex multiplication by

$$\frac{df(z(t))}{dt} = f'(z(t))\frac{dz(t)}{dt}, \tag{1}$$

   here f' is the complex derivative and d/dt is the usual 1-d derivative of a $\mathbb{C}$-valued function.

5. Problem 13 on page 28.

6. Problem 18 on page 29. Note that this includes showing that the series converges. You may only use the elementary techniques introduced thus far.

7. Problem 19 on page 29.

8. Problem 25 on page 30-1.